



CURRENT PRACTICES AND TRENDS  
IN  
MARKETING WESTERN ICEBERG LETTUCE  
IN  
RELATION TO OTHER PRODUCE

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## CURRENT PRACTICES AND TRENDS IN MARKETING WESTERN ICEBERG LETTUCE IN RELATION TO OTHER PRODUCE

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### SUMMARY

Shipments of Western iceberg lettuce account for approximately 20 percent of all carlots of fresh fruits and vegetables shipped from California. Agricultural engineers in the Agricultural Research Service, U.S. Department of Agriculture, have developed a mechanical lettuce harvester. With present packaging methods, the machine is limited by the rate at which the crew can trim and pack the lettuce coming off the machine. The purpose of the study was to provide up-to-date information on current practices, trends, and problems that are encountered during the handling and marketing of lettuce and to determine changes other commodity groups are making.

This study determined that (1) there is sufficient demand for both wrapped and naked lettuce in the major markets in the United States, and (2) the current method of buying and selling lettuce by the head is satisfactory to the receivers. Receivers ex-

pressed the desire for some type of control over the minimum and maximum weights of a carton of lettuce when marketed. Brand identification is of little interest to most receivers of fresh fruits and vegetables. Receivers reported their biggest problems with lettuce are variation of maturity within a lot, crushing of cartons shipped by rail and truck, and rusty-brown discoloration. If the lettuce shipping container is changed, the receivers prefer the same weight or less than the present container. However, many prepackers and institutional buyers are interested in large bulk-bins of lettuce.

In general, receivers handle most of their merchandise on 48- by 40-inch pallets in their warehouse and for store deliveries. Other commodity groups are increasingly unitizing their products. However, some commodities are being unitized on 42- by 36-inch pallets.

### INTRODUCTION

Shipments of Western iceberg lettuce account for approximately 20 percent of all carlots of fresh fruits and vegetables shipped from California, constituting the largest single commodity shipped out of the State. Shipments of lettuce have increased by approximately 17 percent between 1968 and 1972(<sup>1</sup>).<sup>2</sup>

ARS agricultural engineers have been developing a mechanical lettuce harvester over the past several years. The harvester, or one like it, may be the key element of a handling and marketing system that will enable producers to keep pace with increasing consumer demands for lettuce and increasing marketing costs.

Field tests show that the prototype mechanical lettuce harvester can harvest about 450 cartons per hour (24 heads per carton). In comparison, 15 men harvesting lettuce by hand can pick, trim, and pack

<sup>1</sup>Market Quality and Transportation Research, 2021 South Peach Avenue, Fresno, Calif. 93727.

<sup>2</sup>Italic numbers in parentheses refer to items in Literature Cited, p. 9.

180 to 225 cartons per hour (5). With present packaging methods, the machine is limited by the rate at which the crew can trim and pack the lettuce coming off the machine.

Two systems are being investigated to help overcome the restriction in product flow from the harvester into a shipping container. One system would convey the machine-harvested lettuce into a companion bulk trailer for transport to the edge of the field or a central packinghouse for final inspection and packaging. The second system would jumble fill the lettuce into relatively large containers on the harvester, the containers holding 240 heads in place of the present 24-head carton.

The need for an entirely new handling and marketing system for lettuce to fully utilize the capacity of the mechanical harvester prompted

ARS, in cooperation with the California Iceberg Lettuce Research Advisory Board, to conduct a lettuce handling and marketing system study. The purpose of the study was to provide up-to-date information on current practices, trends, and problems encountered during the handling and marketing of lettuce in today's distribution channels (from field to consumer). This information would guide and direct future research and would help determine which systems would best fit the demands of various receivers, wholesalers, and chainstores. The study also would note changes that other commodity groups are making, so that possible changes in lettuce handling would be compatible with attempts to standardize package and pallet sizes for the whole fresh fruit and vegetable industry in the United States.

## PROCEDURE

To obtain valid, up-to-date information on current marketing practices for lettuce and other commodities, four ARS teams personally interviewed representatives of the various trade groups. The personal interview method was selected due to its practicality for obtaining data on general information objectives that could be used as directions for future controlled experiments (9). The field survey included interviews with three marketing groups: Receivers, trade associations, and shippers of other commodities.

The receivers interviewed represented 36 corporate food chains of large, medium, and small size and wholesale terminal handlers of fresh fruits and vegetables in eastern, southern, midwestern, and western cities. A total of 14 major cities were selected for the survey on the basis of the significant volume of lettuce unloaded in these cities and their representative location in various regions of the United States.

The cities surveyed were Atlanta, Austin, Boston, Chicago, Dallas-Fort Worth, Houston, Jacksonville, Memphis, Miami, New York metropolitan area, Oakland-San Francisco area, Philadelphia, and Seattle-Tacoma area. These cities receive approximately 28 percent of all carlots of lettuce unloaded in the United States (2).

Nineteen trade associations and other commodity shipper groups were sampled. These groups represented various geographical locations, types of commodities, and industries affiliated with the fresh fruit and vegetable industry.

A structured, standard questionnaire for each group surveyed was developed by the team conducting the personal interviews. The team consisted of four research personnel from the ARS Western Region and a counterpart from each of the other regions visited.

## RECEIVER RESPONSES

### Lettuce Buying and Selling Practices

#### Wrapped vs. Naked Lettuce

The question of buying practices for wrapped or naked lettuce indicated a demand for both types, but 58 percent preferred naked lettuce and 14 per-

cent preferred wrapped lettuce. In the Northwest, Midwest, and South, naked lettuce was most popular, whereas in the Northeast, wrapped lettuce was in greatest demand. Thirty-three percent of the receivers purchased both wrapped and naked lettuce to meet the demands of individual stores

within a given area. When wrapped lettuce was purchased, 89 percent of the receivers preferred a soft-type film. Most chainstore receivers did not care for film bags.

Preferences for wrapped or naked lettuce were generally based on the same reasons, regardless of area, and are summarized as follows:

*Prefer Wrapped:*

"Our customers ask for wrapped lettuce because it has a better appearance."

"There is no trimming cost, and the product is ready to sell when received."

"Housewives like a product that is not handled and picked over by other customers."

"Housewives say there is less waste because the outer leaves have already been trimmed off."

"Brand names can be shown on each head, and this can be an advantage for quality merchandise."

*Prefer Naked:*

"Naked lettuce is lower in cost than wrapped."

"We prefer to trim our lettuce as required at the retail store to obtain a fresher appearance."

"When wrapped lettuce requires trimming before sale, it costs more to unwrap and trim than to just trim naked lettuce."

"Wrapper leaves help protect the head during transit."

"We prefer to film wrap our lettuce at the retail store."

#### Sale by Head or by Weight

Most receivers said that they buy and sell lettuce by the head. Eighty-six percent of the respondents sell by the head, and only 6 percent sell by weight; the remaining 8 percent sell both by weight and by head.

At the retail level, most store managers felt that lettuce could be sold by weight but at no advantage over traditional per-head sales. Chicago is the only area where the law required sale by weight rather than by head.

The question of imposing mandatory controls, specifying head count within a given weight range for lettuce, brought an affirmative answer from 67 percent of the respondents, who indicated that they were in favor of setting minimum and maximum carton weight. Most receivers were aware that some seasonal variations in weight were unavoidable due to weather and other causes. Of the

responding receivers, 33 percent feared that mandatory controls on weight and count would result in "balled down" heads of heavy lettuce to keep from exceeding a given weight limit and excessive wrapper leaves on light lettuce to meet a minimum weight requirement.

#### Brand Identification

Most receivers (97 percent) were not concerned with brand identification. They reported that once naked lettuce is removed from the carton and placed on display, brand identification is lost. In some instances, individual produce department managers associate certain brand names with quality, but this is usually not the case. Most receivers felt that the quality of individual lots and the general appearance of naked lettuce on display is what sells the product to the housewife. Consumers generally do not know if the lettuce is from California, Florida, New York, or Michigan, unless it is prepackaged or accompanied by point of purchase material.

Receivers of wrapped lettuce reported that brand names are helpful as long as the quality remains high. However, they also stated that the image created by one lot of brand-identified lettuce in bad condition is very difficult to overcome. Housewives seem to remember the bad lot and associate it with the brand name. Overall, brand identification did not seem to be an important factor with the receivers as long as the product was good.

#### Lettuce Shipping Containers and Arrival Condition

##### Shipping Container Size

Most receivers were satisfied with the present 24-head carton. However, one chainstore manager in Jacksonville, Fla., and one in Chicago, Ill., indicated that a smaller carton (12 to 16 heads) would be preferable if changes in container size are planned by the lettuce industry.

Several of the chainstores reported concern about the weight of individual cartons. Heavier boxes of lettuce may result in work rules being imposed by labor unions, but most receivers and wholesalers (70 percent) reported no limitation on package weight or size. One chainstore representative said more women are now handling produce in their retail stores. Their labor union has a lifting limit of 35 pounds per package for women and 55

pounds for men. None of the receivers were interested in a carton larger than the present one or the so-called minibins with 50 to 60 heads, since handling the larger packages would require a handtruck.

Wholesalers who deal with the institutional trade reported that their customers were not concerned with carton size or buying by head count. They were more interested in how many servings there were per carton and the price per serving. These customers liked to have the large, heavy cartons of lettuce.

Wholesalers and chains generally were not interested in large, bulk-filled, pallet-sized bins of 1,000 lbs. capacity. Most of the chainstores and service wholesalers deal with customers that use 2 to 10 boxes per day and have no facilities for handling large bins.

One large chain was interested in trying bulk bins because it trims and packages lettuce at each store. Several large repackers and salad-mix firms also were interested in bulk-bin shipments, if use of bins would lower costs. The U.S. Military Defense Supply agency stated that they would like to look at bulk bins as a new method of handling and shipping lettuce to certain destinations.

#### Arrival Condition Problems

Receivers and wholesalers had several complaints about the condition of lettuce on arrival. The type of problem the receivers had and the percentage of response to each are as follows:

Quality .....	49 percent	Crushing and bruising	20 percent
Packaging .....	20 percent	Maturity .....	10 percent

All respondents reported occasional shipments that arrived with container damage or suffered high losses from decay. The high percentage reported as quality problems may have been of field origin, such as rusty-brown discoloration or other defects.

Their general comments can be summarized as follows:

- There is often too much variation in maturity within a given carton; hard, overly mature heads are combined with soft, less-mature heads.
- Crushing of cartons on the bottom layers of rail and truck shipments was a minor problem in most cases; however, many receivers felt a stronger carton would help reduce damage.
- Rusty-brown discoloration was the disorder

referred to by many receivers as their most critical problem. They felt a closer check should be made at the shipping point to eliminate this problem.

An extensive study conducted by USDA researchers Ceponis and Butterfield (8) on the nature and extent of losses in lettuce marketed in Greater New York indicated that average trim loss from all causes was 4.6 percent at the retail level. Over half the total trim loss was due to mechanical damage.

#### General Warehousing, Handling, and Distribution Practices

Questions pertaining to the receiver's present handling and distribution system were of prime interest to the respondents and generated the most discussion.

A majority (78 percent) of receivers unitize their produce on pallets or in bins. Some large receivers are unitized 100 percent, whereas some small receivers still handle a portion of their commodities box-by-box.

In most large operations, the trend is toward unitized handling. Many of the chainstore warehouses are equipped with racks for multistacking palletized merchandise (fig. 1). Some

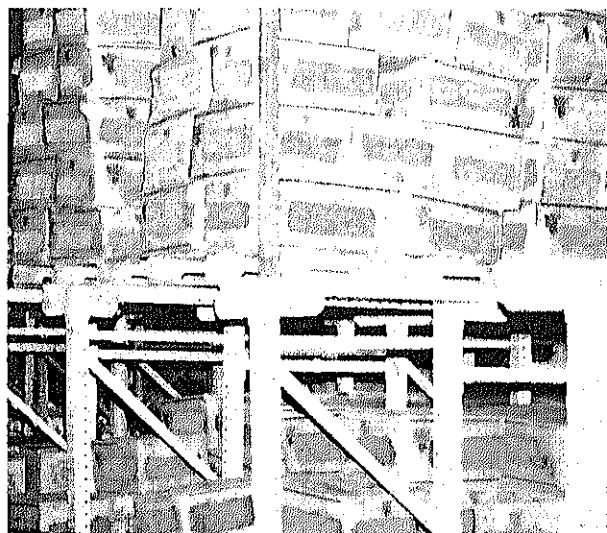


FIGURE 1.—Texas lettuce packaged in the flat-pack carton No. 85-40 palletized on a 48- by 40-inch pallet in a Chicago receivers' warehouse.  
PN-4875

operators are beginning to use computer-controlled automated warehousing systems.

Of the receivers questioned in this survey, 78 percent use the 48- by 40-inch pallet exclusively and prefer to receive shipments on this size pallet. The remaining 22 percent do not require a given size or use some other pallet size. With only one exception, all respondents said they could accept shipments on pallets other than the 48- by 40-inch size, but would either restack on 48- by 40-inch pallets or place the different-size pallets directly on the floor. One respondent said he would like to receive produce on any size pallet, rather than receive handstacked shipments.

The respondents reported that 91 percent of their deliveries from warehouses to retail stores are made on pallets or bins, and the remaining 9 percent are handled box-by-box for small orders. To facilitate pallet handling, the retail stores either have trailer-high loading docks or the delivery trucks are equipped with power tailgates. Many new retail stores can accommodate pallets in their cold-storage rooms. In most older stores, the cold-storage room doors are too narrow for palletized handling of merchandise, and it must be hand stacked. In some instances, pallet bins of such items as melons are placed directly in the store aisle for retail sales. However, most respondents did not feel that this would be an acceptable merchandizing method for lettuce.

Many large service wholesalers and chainstore warehouses make several deliveries of produce each week to individual retail stores. For this reason, the volume of lettuce to each store may range from 2 to 20 cartons per delivery. Relatively few stores could accept a full pallet load of lettuce in a single delivery.

A few receivers were interested in direct deliveries of palletized merchandise from the shipper to individual retail stores. However, they felt that quality control would be a great drawback to any system of multidrop city deliveries by over-the-road truckers. When produce does not move through the receiver's warehouse, he has no opportunity to inspect the merchandise for quality.

### Unitization

The most serious problem with unitized shipments (reported by 40 percent of the respondents) was loss of cubic space in the transport vehicle. Using the 48- by 40-inch pallet wastes about 10 percent of the available loading space in trucks. This loss of cube is not a problem with most high-density commodities because a full payload (maximum weight) can be achieved. However, with such low-density items as leafy vegetables, the loss in payload becomes critical and can result in higher transport costs.

Thirteen percent of the respondents felt that temperature control in unitized loads was a major problem. Unitized commodities are generally tightly stacked within each pallet unit, and the units are often stacked tight within the vehicle. Consequently, air circulation may not reach the center of the pallet or the load, causing problems in temperature maintenance.

Twenty percent of the respondents felt that (1) load shifting, (2) difficulty in achieving thorough quality inspection, (3) poor quality pallets, and (4) variations in the size of pallets were major problems. The remaining 27 percent of the respondents had no major problem with unitized loads.

## TRADE ASSOCIATION AND OTHER COMMODITY GROUP RESPONSES

These groups were contacted to determine current practices, trends, and planned changes in their handling and marketing systems. Such information will be helpful to avoid duplication of research. In addition, it will help take advantage of improved techniques already adopted by other industries and assure compatibility of future lettuce handling systems with those of other industries.

### Unitized Commodities

Some commodities are presently being shipped by individual shippers for their own convenience in handling and loading. Disposable wooden slipsheets are generally used by these shippers to keep their costs low.

The following commodities are being received on pallets or slipsheets in varying amounts:

watermelons	cucumbers	onions	grapes
tomatoes	eggplants	citrus	soft (tree) fruits
potatoes	peppers	peas	cantaloupes
strawberries	avocados	apples	pears

In addition, a small volume of the following commodities is being shipped in bin containers:

watermelons	squash	onions	cabbages
cantaloupes	citrus	potatoes	pumpkins

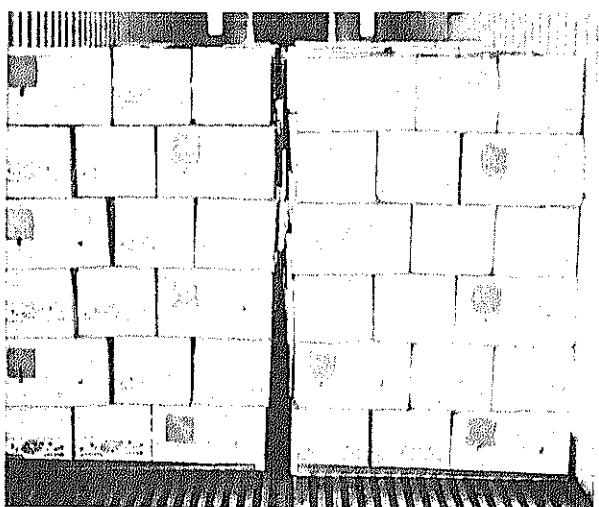
In this survey, we did not determine the volume of unitized movements on pallets, slipsheets, or bins. However, two studies conducted by the United Fresh Fruit and Vegetable Association showed that 41 percent of shippers were making some palletized shipments (3, 4).

The Florida Fruit and Vegetable Association reported a general trend in many commodities toward mechanization of harvesting and packaging. Considerable progress has been made toward mechanized harvesting of radishes, sweet corn, celery, and carrots. In addition, several large shippers are unitizing their produce for in-house handling and shipping. A good example of these changes can be seen in the celery industry. The former "mule train" system of harvesting and packaging in the field has given way to mechanization.

The new system consists of a two-man operation for mechanically harvesting celery. One man operates the harvester, and the other drives a truck alongside to collect the celery, which is then transported to a central plant for packaging and shipping. This system may have application in the lettuce industry. Grizzell and Henry (10) described the improved system in detail.

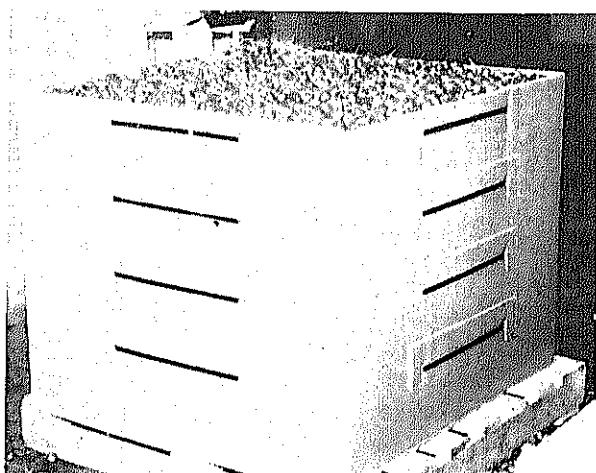
The Florida Fresh Citrus Shippers' Association reported extensive studies on a mechanical harvester for citrus, with several prototypes showing promise for commercial production. Unitization of Florida citrus has become widespread with an ever-increasing portion of their crop moving on slipsheets. Slipsheets are also very popular in the Texas citrus industry (fig. 2). This low-cost method (about 50 cents per slipsheet) gives the packinghouse the ability to handle and ship unitized produce without the high cost of wooden pallets (6, 7). Some Florida radish shippers are now using pallet bins for bulk shipments to repackers (fig. 3).

In the Pacific Northwest, apple and pear shippers reported that less than 1 percent of their



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FIGURE 2.—Texas citrus unitized on a 40- by 48-inch slipsheet.



PN-4377

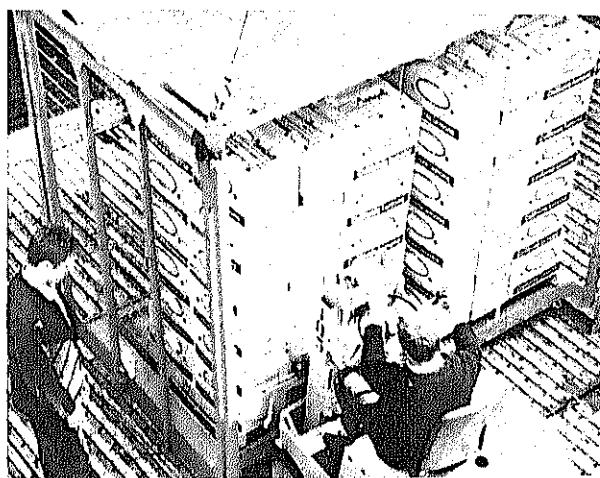
FIGURE 3.—Florida radishes in a reinforced fiberboard, bulk-bin box mounted on a pallet for shipment to a repacker.

shipments are palletized. Loads are palletized only when requested by the receiver, and a charge of 10 cents per carton is usually added. Respondents disagreed as to a trend toward palletization and cited major problems, such as high costs, loss of cubic space in transport vehicle, and difficulty in bracing a load of palletized fruit in the transport vehicle. However, shipments of cherries and prunes in the Pacific Northwest are being palletized. These fruits are packed in 12- and 20-lb packages, which are hand stacked on pallets measuring 35 by 42 inches (11).

In the California fruit industry, an ever-increasing amount of produce is being unitized on

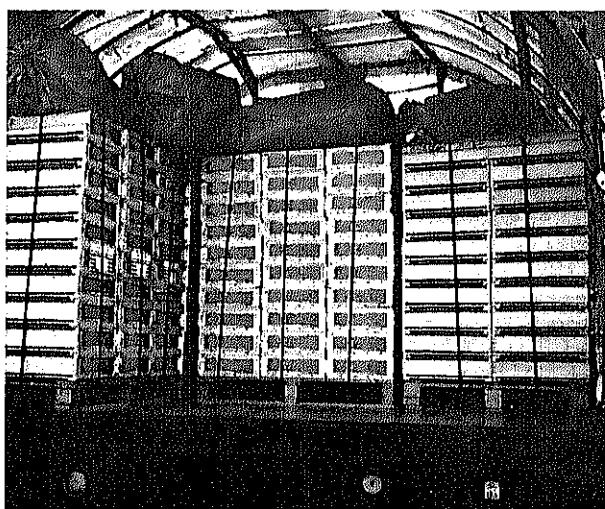
expendable wooden pallets measuring 42 by 35 inches for tree fruit and 41 by 35 inches for citrus (figs. 4 and 5). In 1970, the California Grape and Tree Fruit League surveyed receivers to determine their container and pallet needs and major problems. Many of the findings in this survey are still valid and indicate that receivers prefer:

1. A low-cost disposable wooden pallet, unless a hardwood pallet built to the Grocers Manufacturing Associations' specifications is supplied.
2. A wooden pallet rather than a plastic one.
3. Slipsheets are satisfactory, but not all



PN-4378

FIGURE 4.—California citrus on 41- by 35-inch disposable, wooden pallets being unloaded from a ship in Rotterdam, The Netherlands.



PN-4379

FIGURE 5.—California cherries in an 18-lb box strapped on a 42- by 35-inch pallet ready for air shipment.

receivers are equipped with the special lift trucks to handle them.

4. Disposing of expendable wooden pallets is a costly problem.

5. If railcars are unloaded from a team track where you cannot use a fork truck, pallets are of little advantage.

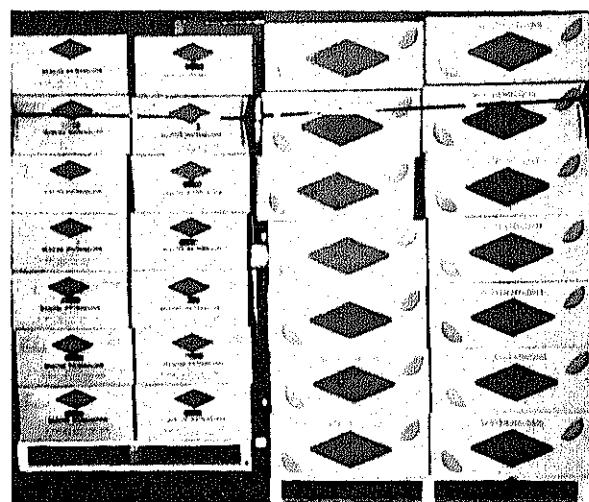
6. Receivers would be willing to discuss sharing the cost of palletization with the shipper.

Most potatoes are still hand loaded in railcars and trucks, and only a small percentage are shipped on pallets. A few shippers use pallet bins, whereas others package their potatoes in cartons, which are then stacked on slipsheets.

The watermelon industry is moving away from shipping bulk-loaded melons to chainstores and large service wholesalers. More melons are being boxed or packed in pallet bins to reduce damage and handling costs throughout the marketing system. Figure 6 shows a load of boxed and palletized watermelons. In many cases, these units are moved from the shipper through the wholesale warehouse and on to the retail store as a unit.

The California strawberry industry has shifted almost 100 percent to unitization on 39- by 39-inch disposable pallets. These units are moved by truck and air to all major domestic and overseas markets.

Most of the produce coming into the United States from Mexico through Nogales is unitized on



PN-4380

FIGURE 6.—Boxed watermelons unitized on 48- by 40-inch disposable wooden pallets.

disposable pallets before being shipped to final destination. In addition, imports from Chile are being shipped on pallets to receivers in the United States.

### Standardization of Packaging and Pallet Sizes

The Corrugated Container Institute<sup>3</sup> (Division of the Fibre Box Association) reported a definite trend toward reducing the number and sizes of boxes used by the produce industry. However, standardization of packaging or pallets was the most controversial topic in the entire study. Respondents gave a variety of viewpoints in their discussions and indicated a desire and need to establish standards. A large number of meetings, surveys, and reports on this subject have come from both private industry and governmental agencies in the United States and foreign countries. Some progress has been made toward standardization, but at this time no mandatory standards are in effect.

In this study, 78 percent of the respondents indicated that they are using the 48- by 40-inch pallet in their produce operations. For uniformity, they would prefer to see all products handled on this size pallet.

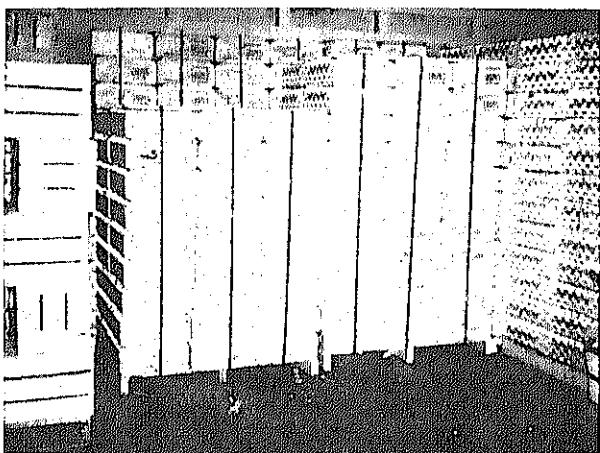
Stokes and Woodley (13) reported on many of the problems and trends in standardization and also on the effects of proposed international standards. In addition, they listed all the sizes of packages used in the produce industry plus their popularity and efficiency of space utilization on pallets.

Because a change to the metric system in the United States appears likely in the next few years, future researchers should consider using standard metric sizes for any new carton or pallet that may be tested. The Organization for Economic Coopera-

tion and Development, a United Nations' agency in Paris, is recommending four standard base sizes for all produce packages. Stokes and Woodley (13) discussed these recommendations in detail.

The National Association of Food Chains stated that most of its members are now using the 48- by 40-inch pallet. The association is currently conducting a study on modularization. Some preliminary comments from researchers on that project have indicated their awareness that the 48- by 40-inch pallet does not fit very well in most produce transportation vehicles.

Many of the tree fruit and citrus shippers in California are using pallets extensively and, with few exceptions, are using pallet sizes other than the 48 by 40 inches (fig. 7) (12). The most popular size is 42 by 35 inches because it fits well in both trucks and railcars and makes good utilization of available loading space.



PN-4881

FIGURE 7.—California grapes in the new 40- by 50-centimeter box equal to 15-½ by 19-11/16 inches. They are stacked on a 120- by 100-centimeter disposable wooden pallet equal to 47-¼ by 39-¾ inches.

## DISCUSSION

Handling and shipping practices for Western iceberg lettuce have changed little over the last 20 years. With improved handling technologies and trends towards mechanization of harvesting, methods of shipping lettuce should be reviewed and altered to increase marketing efficiency. This study helps determine areas in which changes could be made and identifies problems that may be

encountered in new systems for handling, marketing, and distributing lettuce.

Major problems identified by receivers were lettuce disorders, particularly rusty-brown discoloration, and excessive variation in maturity and size of lettuce heads within a given lot. These problems are either related to growing or harvesting practices.

The method of packaging is an important element in increasing the efficiency of marketing let-

<sup>3</sup>Personal communication.

tuce. Receivers indicated that the biggest problem with the presently used carton is that the bottom layers of loads are crushed during shipping. If the lettuce industry undertakes a change in size of shipping containers, the receivers would prefer a container of about the same size or smaller than the one now in use. However, some repackagers and the institutional trade are interested in bulk-bin shipments of lettuce. The receivers were interested in some type of voluntary control over a specified head count within a given minimum and maximum carton weight.

Most receivers merchandise lettuce by the head, and they see no advantage in selling by weight. There is sufficient demand for both wrapped and naked lettuce, indicating both types should be offered to the market. Receivers were not concerned with brand identification. They reported that once naked lettuce is removed from the carton and placed on display, brand identification is lost.

Receivers handle most of their merchandise on 48- by 40-inch pallets in their warehouses and for store deliveries. Their warehouses are equipped with racks for multistacking palletized merchandise. The existing racks restrict the size of the

pallets to 48 by 40 inches; however, receivers did not rule out accepting merchandise on the 42- by 35-inch pallets.

Many other commodities in the fresh fruit and vegetable industry are being unitized, mostly on 42- by 35-inch pallets. The major grower-shipper associations in the West favor 42- by 35-inch pallets. Most of their shipping containers fit this pallet, which also uses the cube in transport vehicles more efficiently than the 48- by 40-inch pallets.

Future research should be directed towards development of an optimum method of packing mechanically harvested lettuce. Comparisons should be made among packing on the harvester, packing at the edge of the field, or packing in a central plant. One or more new sizes of shipping containers must be developed so lettuce can be unitized or efficiently hand-stacked for optimum use of space in existing transportation units.

Any new system developed for the marketing of lettuce should increase efficiency, maintain high quality, and help stabilize the costs of marketing Western iceberg lettuce.

## LITERATURE CITED

- (1) ANONYMOUS.  
1972. MOVEMENT OF CALIFORNIA FRESH FRUITS AND VEGETABLES.  
U.S. Dept. Agr., Agr. Market Serv., Market. News Br., 19 pp.
- (2) \_\_\_\_\_.  
1973. FRESH FRUIT AND VEGETABLE UNLOADS, CALENDAR YEAR 1973.  
U.S. Dept. Agr., Agr. Market Serv., FVUS 1,2,3,4.
- (3) \_\_\_\_\_.  
1973. UNITED FRESH FRUIT AND VEGETABLE ASSOCIATION SUMMARY REPORT.  
Unitization Committee, Palletization Profile, Feb. 1973, 7 pp. Washington, D.C.
- (4) \_\_\_\_\_.  
1974. UNITED FRESH FRUIT AND VEGETABLE ASSOCIATION SUMMARY REPORT.  
Palletization and Productivity Committee, Feb. 1974, 4 pp. Washington, D.C.
- (5) \_\_\_\_\_.  
1974. HARVESTING LETTUCE ELECTRONICALLY.  
Agr. Res. 22(7): 8-11.
- (6) ANTHONY, J. P.  
1969. DEVELOPMENT OF STACKING PATTERNS FOR HANDLING AND TRANSPORTING UNITIZED SHIPMENTS OF FLORIDA CITRUS.  
U.S. Dept. Agr., Agr. Res. Serv. ARS 52-42, 66 pp.
- (7) \_\_\_\_\_.  
1970. LABOR AND EQUIPMENT REQUIREMENTS AND COSTS FOR UNITIZED AND NON-UNITIZED LOADING OF FLORIDA CITRUS INTO HIGHWAY TRAILER VANS.  
U.S. Dept. Agr., Agr. Res. Serv. ARS 52-53, 15 pp.
- (8) CEAPONIS, M.J., and BUTTERFIELD, J. E.  
1973. THE NATURE AND EXTENT OF RETAIL AND CONSUMER LOSSES IN APPLES, ORANGES, LETTUCE, PEACHES, STRAWBERRIES, AND POTATOES MARKETED IN GREATER NEW YORK.  
U.S. Dept. Agr., Market. Res. Rpt. 996, 23 pp.
- (9) DOMINICK, B. A.  
1960. RESEARCH IN RETAIL MERCHANDISING OF FARM PRODUCTS, APPRAISAL OF METHODS AND ANNOTATED BIBLIOGRAPHY.  
U.S. Dept. Agr., Market. Res. Rpt. 416, 46 pp.
- (10) GRIZZELL, W. G., and HENRY, F. E.  
1971. CENTRAL PACKING-PRECOOLING SYSTEM FOR CELERY.  
U.S. Dept. Agr., Market. Res. Rpt. 869, 34 pp.
- (11) HINSCH, R. T., FOUNTAIN, J. B., and RIJ, R. E.  
1970. NEW SHIPPING CONTAINERS FOR FRESH WESTERN CHERRIES—COSTS, PERFORMANCE, AND TRADE ACCEPTANCE.  
U.S. Dept. Agr., Market. Res. Rpt. 902, 12 pp.  
and Rij, R.E.
- (12) \_\_\_\_\_.  
1970. FEASIBILITY OF SHIPPING CALIFORNIA TABLE GRAPES IN FIBEROBOARD AND POLYSTYRENE FOAM BOXES AND IN POLYETHYLENE MESH BAGS.  
U.S. Dept. Agr., Market. Res. Rpt. 871, 12 pp.
- (13) STOKES, D. R. and WOODLEY, G. W.  
1974. STANDARDIZATION OF SHIPPING CONTAINERS FOR FRESH FRUITS AND VEGETABLES.  
U.S. Dept. Agr., Market. Res. 991, 118 pp.